

WHAT IS CLAIMED IS:

1. A liquid discharge head comprising:
  - a discharge energy generating element for generating energy for discharging a liquid droplet;
  - 5 an element base plate provided with said discharge energy generating element on the main surface thereof; and
  - an orifice base plate bonded to the main surface of said element base plate, being provided
  - 10 with a nozzle having a discharge port portion with a discharge port for discharging liquid droplet, a bubbling chamber for generating a bubble in liquid therein by said discharge energy generating element, and a supply path for supplying liquid to said
  - 15 bubbling chamber, and a supply chamber for supplying liquid to said nozzle, wherein
  - said bubbling chamber is formed by a first bubbling chamber communicated with said supply path with the main surface of said element base plate as
  - 20 the bottom face thereof for generating bubble in liquid therein by said discharge energy generating element, and also, a second bubbling chamber communicated with said first bubbling chamber, and the central axis of the lower face of said second
  - 25 bubbling chamber and the central axis of the upper face of said second bubbling chamber are in agreement in the direction perpendicular to said base plate,

and

the sectional area of the upper face with respect to the central axis of said second bubbling chamber is smaller than the sectional area of the lower face with respect to the central axis of said second bubbling chamber, and the sectional area in the direction toward the central axis is continuously changed from the lower face to the upper face of said second bubbling chamber, and

on the circumferential portion of the upper face of said first bubbling chamber in parallel with the main surface of said element base plate, and in contact with the opening communicated with said second bubbling chamber, an extrusion is formed continuously to surround said opening in the direction toward the main face of said element base plate.

2. A liquid discharge head according to Claim 1, wherein the sectional area of the sidewall face of said second bubbling chamber is continuously changed in the direction toward the central axis from the lower face to the upper face of said second bubbling chamber at an inclination of 10 to 45° to the plane orthogonal to the main surface of said element base plate.

3. A liquid discharge head according to Claim 1, wherein said first bubbling chamber is surrounded by a nozzle wall in three directions for partitioning a plurality of said nozzles arranged in parallel

5 condition into each individual nozzle, and

a wall face of said discharge port portion are in parallel with the plane orthogonal to the main surface of said element base plate.

10 4. A liquid discharge head according to Claim 1, wherein said first bubbling chamber is surrounded by a nozzle wall in three directions for partitioning a plurality of said nozzles arranged in parallel condition into each individual nozzle, and

15 a wall face of said discharge port portion are provided with a taper of  $10^\circ$  or less to the plane orthogonal to the main surface of said element base plate.

20 5. A liquid discharge head according to Claim 1, wherein the upper face of said supply path on the said supply chamber side in parallel with the main surface of said element base plate is higher than the upper face of said supply path continued on one and  
25 the same plane with the upper surface of said first bubbling chamber, and connected with a difference in level, and

the largest height of said supply path from the surface of said element base plate is lower than the height from the surface of said element base plate to the upper face of said second bubbling chamber.

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6. A liquid discharge head according to Claim 1, wherein at least in a part of said supply path, the width of said supply path on the plane orthogonal to the flow direction of liquid is changed in the thickness direction of said orifice base plate.

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7. A liquid discharge head according to Claim 1, wherein the sectional area of said nozzle from said discharge port to said supply chamber is further structured to be changed by plural differences in level.

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8. A liquid discharge head according to Claim 1, wherein said nozzle is formed so as to orthogonalize the discharge direction of flying droplet from said discharge port and the flowing direction of liquid flowing in said supply path.

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9. A liquid discharge head according to Claim 1, wherein said nozzle is formed so as to make the total sum of the volumes of said first bubbling chamber, the second bubbling chamber, and the discharge port

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portion smaller than the volume of said supply path.

10. A liquid discharge head according to Claim 1, wherein bubble generated by said discharge energy  
5 generating element is communicated with the air outside at the time of discharging liquid droplet.

11. A liquid discharge head according to Claim 1, wherein said orifice base palate is provided with  
10 said nozzle in the plural number corresponding to said discharge energy generating element, respectively, and said plural nozzles are divided into a first nozzle array having the longitudinal direction of each nozzle arranged in parallel, and a  
15 second nozzle array having the longitudinal direction of each nozzle arranged in parallel in the position facing said first nozzle array with said supply chamber between them, and

the center line of each of said nozzles in said  
20 second nozzle array is arranged so as to be displaced by 1/2 pitch between each of adjacent nozzles with respect to the center line in the longitudinal direction of each of said nozzles of said first nozzle array.

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12. A method for manufacturing the liquid discharge head provided with a discharge energy

generating element for generating energy for  
discharging liquid a droplet;

an element base plate provided with said  
discharge energy generating element on the main  
5 surface thereof; and

an orifice base plate bonded to the main  
surface of said element base plate, being provided  
with a nozzle having a discharge port portion with a  
discharge port for discharging a liquid droplet, a  
10 bubbling chamber for generating bubble in liquid  
therein by said discharge energy generating element,  
and a supply path for supplying liquid to said  
bubbling chamber, and a supply chamber for supplying  
liquid to said nozzle, comprising the following steps  
15 of:

forming a thermal bridging film on the element  
base plate having a discharge energy generating  
element provided for the main surface therefor by  
coating and heating thermo-bridge organic resin of  
20 solvent-dissolvable type for forming a pattern of the  
first bubbling chamber and supply path;

coating on said thermal bridging film organic  
resin of solvent-dissolvable type for forming pattern  
of the second bubbling chamber;

25 exposing and developing said organic resin for  
the pattern formation of said second bubbling chamber  
by use of Near-UV light in the region of 260 to 330

nm, and also, forming a recessed portion continuously on said thermo-bridge organic resin near the pattern for the formation of said second bubbling chamber in order to form said first bubbling chamber and said  
5 supply path;

forming an inclination of 10 to 45° by heating said organic resin at a temperature lower than that of glass transition after exposing and developing said thermal bridging film by use of Deep-UV light in  
10 the region of 210 to 330 nm;

laminating the orifice base plate provided with discharge port portion by coating, exposing, developing and heating positive type organic resin on the flow path pattern formed by said double-layered  
15 solvent-dissolvable film; and

forming the orifice base plate bonded to the main surface of said element base plate, being provided with the nozzle having said discharge port portion for discharging a liquid droplet, the  
20 bubbling chamber for generating bubble by said discharge energy generating element, and said supply path for supplying liquid to said bubbling chamber, and the supply chamber for supplying liquid to said nozzle by removing said double-layered flow path  
25 formation organic resin formed on the lower layer by irradiating Deep-UV light through said orifice base plate and by use of solvent.

13. A method for manufacturing the liquid  
discharge head according to Claim 12, wherein the  
height of said first bubbling chamber and said supply  
chamber on said element base plate is 5 to 20  $\mu\text{m}$ , and  
5 formed at an inclination of 0 to  $10^\circ$  to the plane  
orthogonal to the main surface of said element base  
plate.

14. A method for manufacturing the liquid  
10 discharge head according to Claim 12, wherein the  
thermo-bridge organic resin for forming said first  
bubbling chamber and said supply path has methyl  
methacrylate as the main component, and formed by  
dissolving in coating solvent a material synthesized  
15 by polymerizing methacrylic acid and methacrylate  
ester.